

The following slides presented some provisional results to the Projections Sub-Group in August 2015. However, the results have been superseded by the NRS publication of Population and Household Projections for Scottish Sub-council Areas on 23 March 2016.

Sub-Council Area Projections

Angela Adams
Population and Migration Statistics NRS
August 2015

About me - Angela Adams

- Seconded to National Records of Scotland for 10 months from June 2015 to March 2016 to work on Small Area Projections project
- Background – Strategic Town Planner for Clydeplan, the Glasgow and the Clyde Valley Strategic Development Planning Authority
- We produce a 5 year development plan covering cross-boundary issues for 8 local authorities East & West Dunbartonshire, East Renfrewshire & Renfrewshire, Glasgow City, Inverclyde, North and South Lanarkshire
- My responsibility was strategic housing issues, essentially how many houses do we need and where are they going to go
- Recently completed the second Housing Need and Demand Assessment and this is being taken through the second Strategic Development Plan which will be published in January 2016 for consultation

Outline

- Developing the methodology
- Assumptions
- Results of test council area 2012-based population projections
- Next Steps

Developing the Methodology

- Previous work and Research Findings
- POPGROUP overview
- POPGROUP model
- Stages of POPGROUP

Aware that some councils undertake their own projections so please feel free to contribute your own experiences throughout the presentation

Previous Work

- Projections for small areas of Scotland below council area level are not produced by NRS, except for the national parks.
- In 2010 NRS carried out research with Professor Ludi Simpson from the Cathie Marsh Centre for Census and Survey Research (CCSR) at the University of Manchester into the demographic data needed to allow councils and health boards to produce population projections at small area level.
- Guidance published for those using POPGROUP to produce local area projections. <http://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/population/population-projections/small-area-population-projections>
- As part of the research a report *Small Area Population Projections Fife Multi-Member Ward Projections Comparison of Different Scenarios Using POPGROUP* explored the impact of including detailed demographic data to determine what data could be made available to councils while maintaining confidentiality

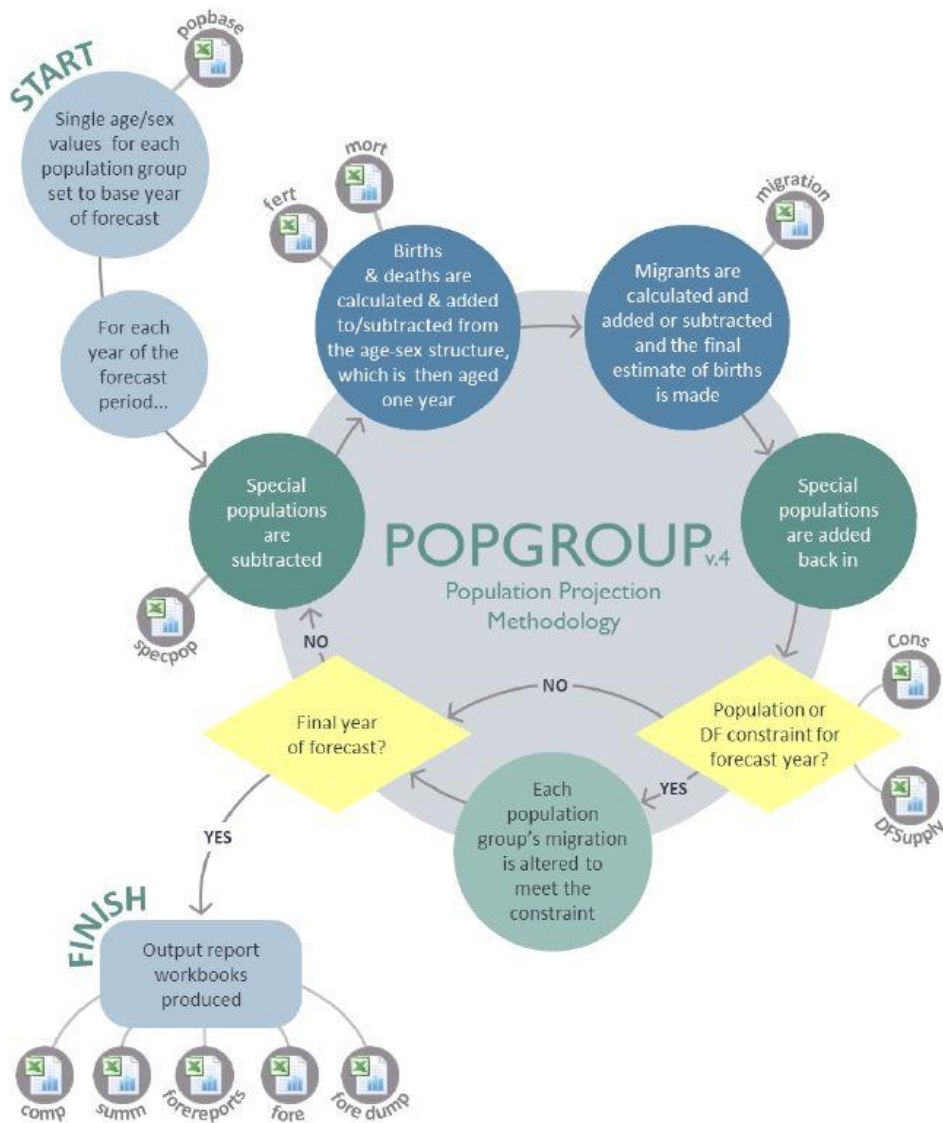
Research Findings

- The use of total fertility rates and standardised mortality ratios should be sufficient for most purposes with common Scotland age-sex patterns.
- Although local age-specific fertility and mortality rates can add some accuracy to the projections the data they require would have slightly different definitions to the Mid-Year estimate data and there are confidentiality issues about providing this data for small areas.
- POPGROUP indirectly estimates migration therefore direct counts of local migration are not needed. When tested with local migration data the report recommends that population projections will not be significantly helped by migration measured from census or health data for data zones. There are also confidentiality issues about providing this data for small areas.
- The findings have been taken on board to inform the methodology for this project

POPGROUP Overview

- POPGROUP is a family of demographic models developed to generate population, household and other projections for specified geographical areas
- It is excel based and projections can be developed using a variety of data inputs and assumptions
- POPGROUP uses the cohort component method
- It estimates past levels of fertility, mortality and migration, which can be used for assumptions about the future for each local area
- Sub-National projections are designated as National Statistics by the UK Statistics Authority
 - Sub-Council Area projections will be Official Statistics as such will follow the Code of Practice and pre-release rules

POPGROUP Model



Cohort Component Method

- Base year population
- For each year of the projection the population is aged and estimates are made for births, deaths and migration based on the fertility, mortality and migration assumptions
- Special populations are removed at the start of each year and added back in at the end of each year
- Each year the projection can be constrained to existing council area projections
- Outputs projections and a range of reports, tables, charts and population pyramids

Stages of POPGROUP

- POPGROUP can be used in a number of different ways - this sets out the way we have used it for this project
- POPGROUP operates in a number of stages
 - Stage 1 – Local inputs of past births, deaths and population estimates input to Training projection
 - Stage 2 – Run Training projection to estimate local demographic rates
 - Stage 3 – Run main projection continuing past rates, constrained to Council Area projection

Steps in strategy	Summary of actions or outputs for each small area		
1. Data allocated to each small area	Births since 2001	Deaths since 2001	Population estimates since 2001
2. Training projection	Local fertility differential	Local mortality differential	Local net migration
3. Migration-led projection	Local fertility and mortality differences continued, with future Scotland time trend		Local migration continued

Stage 1 - Data inputs to Training Projection

- Popbase.xls
 - 2001 population SYOA/Sex/Ward (SAPE)
- Fert.xls
 - 2002-2013 births Total/Sex/Ward (SAPE input)
 - Fertility schedule of age-specific rates taken from 2012 NPP Scotland
- Mort.xls
 - 2002-2013 deaths 5 year age bands/Sex/Ward (SAPE input)
 - Mortality schedule of age-sex specific rates taken from 2012 NPP Scotland
- Cons.xls
 - 2002-2013 population SYOA/Sex/Ward (SAPE)
- Specpop.xls (if using)

Stage 2 - Training Projection

- Training projection
 - The training projection uses past information i.e. the difference between the annual population estimates to estimate net migration
 - It also calculates differences between each area's fertility and mortality from past births and deaths
- Migration.xls
 - Estimates of past net migration
- Fert.xls
 - Local fertility differentials
- Mort.xls
 - Local mortality differentials

Stage 3 – Main/Migration Projection

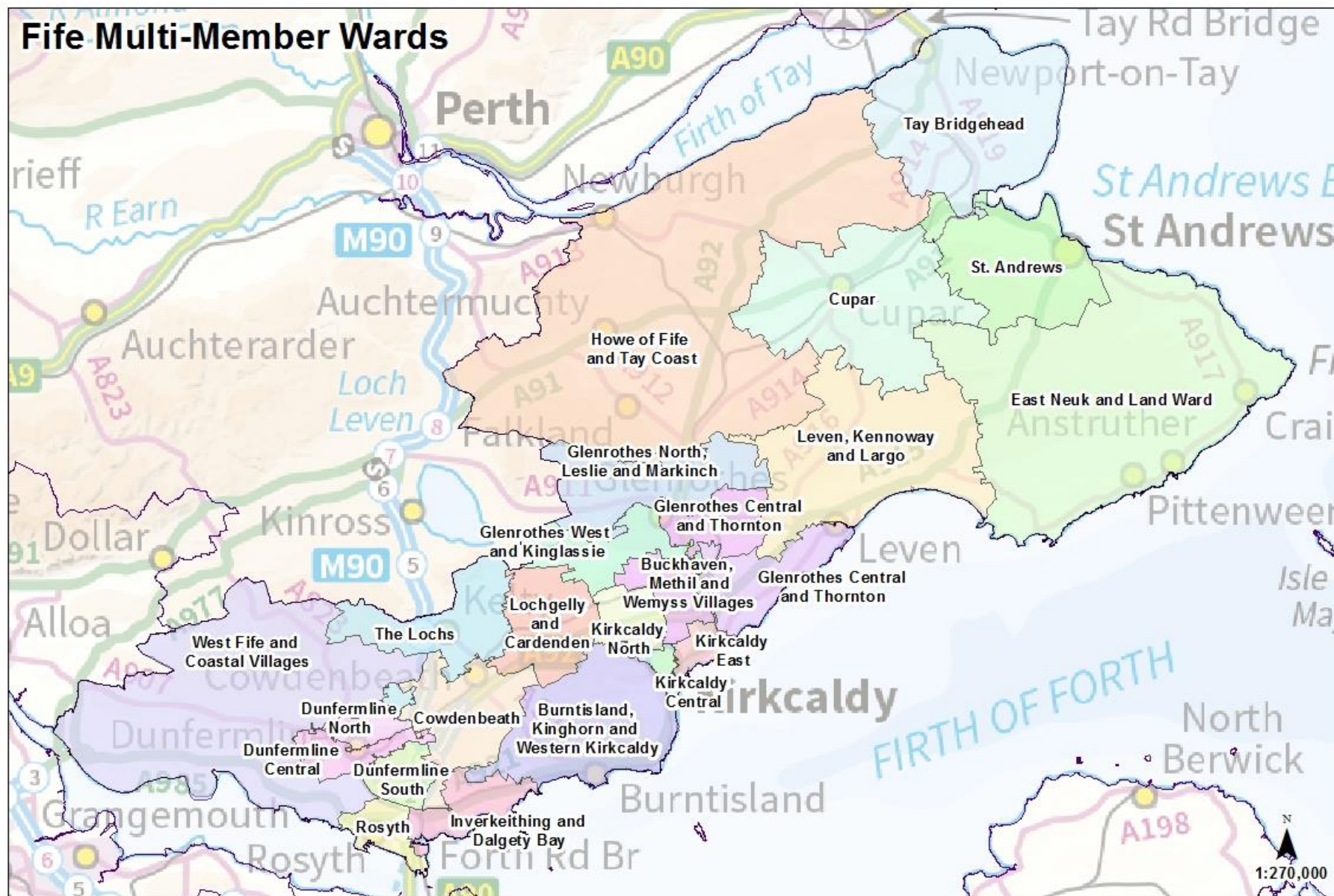
- Migration Projection
 - The training projection estimates for migration, fertility and mortality are used in the final projection which assumes the continuation of recent experience in each small area
 - It also incorporates the future changes in fertility and mortality that are expected for Scotland as a whole
- Migration.xls
 - User computes estimates of local migrants and age-specific migration rates
 - In and out migrants are estimated separately but only the net impact at each age-sex is known from the past
- Fert.xls
 - User computes local area fertility differentials
- Mort.xls
 - User computes local area mortality differentials
- Cons.xls constrains to -
 - 2013 SAPE; 2014 Mid-Year Population Estimates council area
 - 2015-2022 population SYOA/Sex/Ward (2012-based sub-national projections)

Dealing with Special Populations

- Special populations (Specpop.xls) can be identified e.g. Armed Forces, Prisoners and Students
- Popgroup removes these at the start of each year of the projection and puts them back in at the end of the year i.e. they are not aged on and do not input to the fertility, mortality or migration assumptions.
- For future special populations the user could take an average of recent years and apply this to future years.
- For Fife we will run a projection with the Armed Forces data to see the impact that it might have.
- From the previous research it suggested that it may not be beneficial to include them.
- We will look again at this position for areas particularly impacted by special populations.

Test Council Area Fife

Fife Multi-Member Wards



Assumptions

Calculating the Fertility Differential

Fertility Differential

Ward	TFR Average (2002- 2013)	TFR Differential (2002-2013)
		TFR Average/ Average Scotland TFR
West Fife and Coastal Villages	1.78	1.09
Dunfermline North	1.70	1.04
Dunfermline Central	1.68	1.03
Dunfermline South	2.11	1.29
Rosyth	1.79	1.10
Inverkeithing and Dalgety Bay	1.79	1.10
The Lochs	2.02	1.24
Cowdenbeath	1.81	1.11
Lochgelly and Cardenden	1.88	1.15
Burntisland, Kinghorn and Western		
Kirkcaldy	2.02	1.24
Kirkcaldy North	1.88	1.15
Kirkcaldy Central	1.89	1.16
Kirkcaldy East	1.90	1.16
Glenrothes West and Kinglassie	1.83	1.12
Glenrothes North, Leslie and Markinch	1.71	1.05
Glenrothes Central and Thornton	1.80	1.10
Howe of Fife and Tay Coast	1.82	1.12
Tay Bridgehead	1.92	1.18
St. Andrews	0.54	0.33
East Neuk and Land Ward	1.64	1.00
Cupar	1.82	1.11
Leven, Kennoway and Largo	1.71	1.05
Buckhaven, Methil and Wemyss Villages	1.99	1.22
FIFE	1.76	1.08
SCOTLAND	1.63	

The Fertility differential provides a 'weighting' factor to account for differences between Scotland age-specific fertility and local trends.

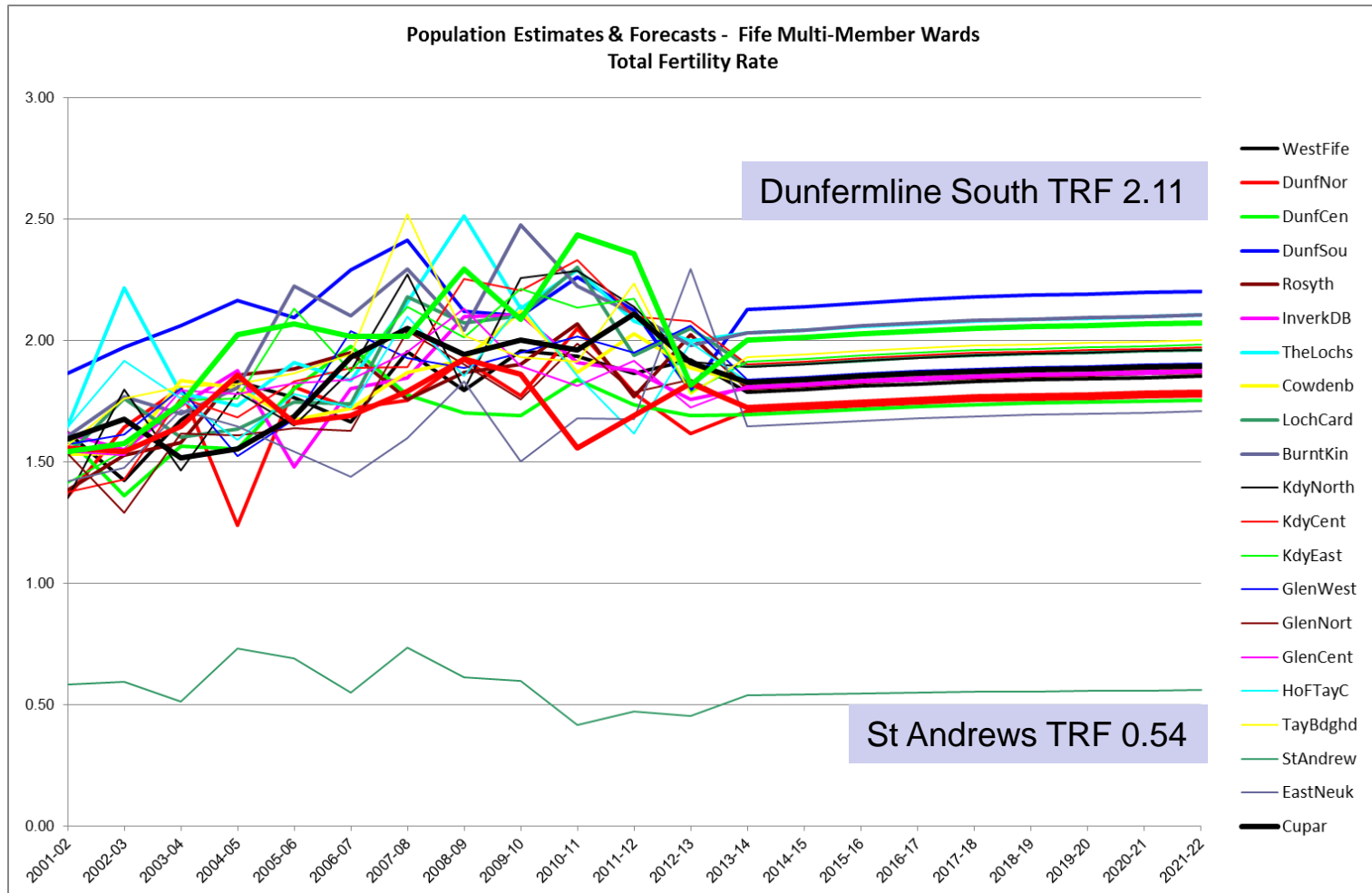
The training projection calculates the Total Fertility Rate (TFR).

The average TFR is calculated for each area 2002-2013 and is divided by the Scotland average TFR for the same period to give the differential.

The differential is fed into the Main projection, otherwise known as the Migration projection.

Fife TFR higher than Scotland TFR

Fife Total Fertility Rate 2001-2022



There are variations to the TFR within Fife and each past year. The highest TFR is in Dunfermline South where families are moving in to new housing

Calculating the Mortality Differential

Mortality Differential		
Ward	Average Standardised Mortality Ratio	Mortality Differentials (2002-2013)
West Fife and Coastal Villages	114.3	1.02
Dunfermline North	138.2	1.23
Dunfermline Central	113.2	1.01
Dunfermline South	102.8	0.92
Rosyth	111.7	1
Inverkeithing and Dalgety Bay	93.6	0.83
The Lochs	126.3	1.13
Cowdenbeath	128.7	1.15
Lochgelly and Cardenden	126	1.12
Burntisland, Kinghorn and Western Kirkcaldy	106.9	0.95
Kirkcaldy North	112.3	1
Kirkcaldy Central	117.2	1.04
Kirkcaldy East	130.7	1.16
Glenrothes West and Kinglassie	116.3	1.04
Glenrothes North, Leslie and Markinch	112.7	1
Glenrothes Central and Thornton	124.9	1.11
Howe of Fife and Tay Coast	96.9	0.86
Tay Bridgehead	100.7	0.9
St. Andrews	90.1	0.8
East Neuk and Land Ward	98.9	0.88
Cupar	110.2	0.98
Leven, Kennoway and Largo	112.7	1
Buckhaven, Methil and Wemyss Villages	134.3	1.2
Fife	113.8	

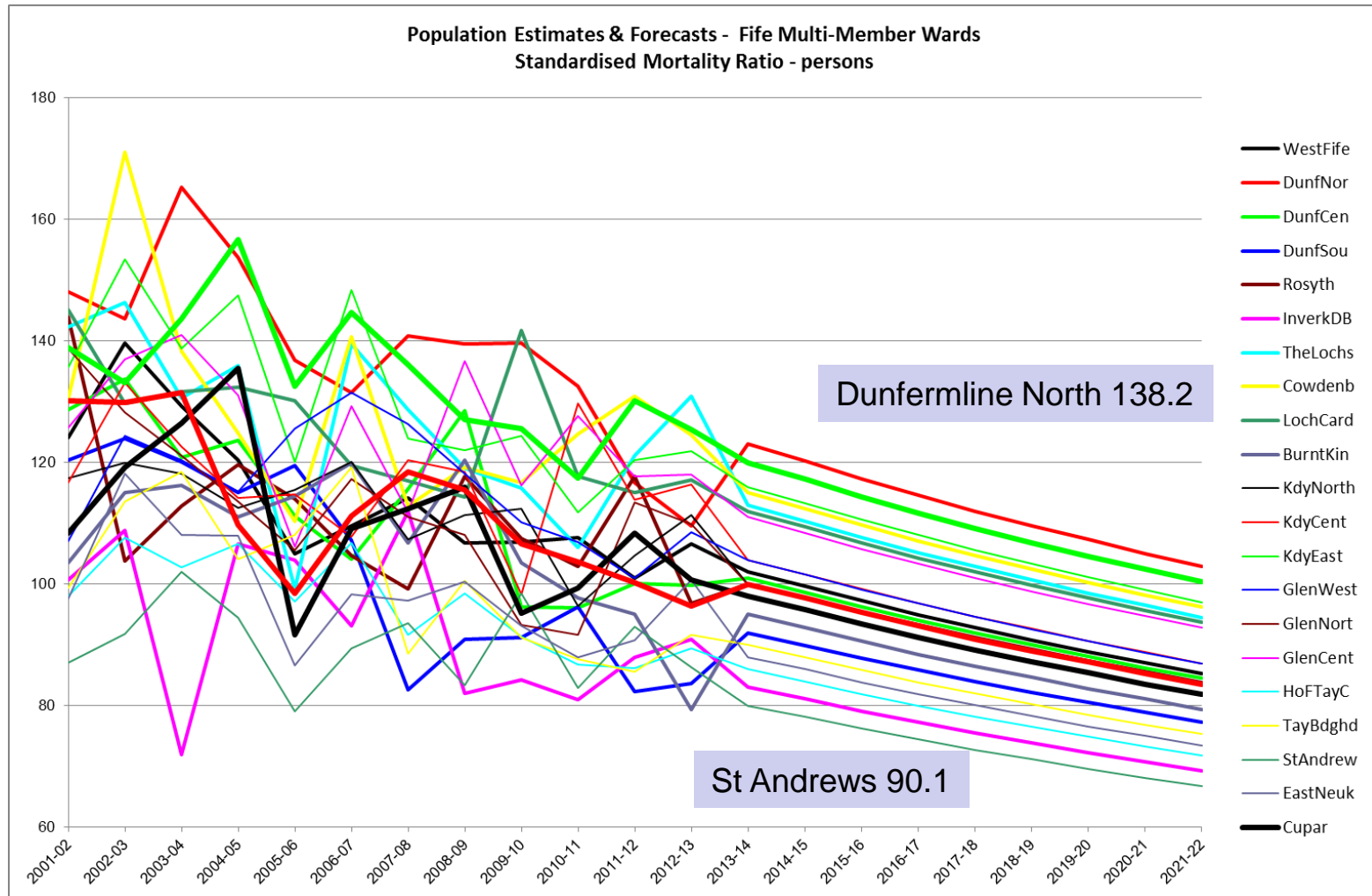
The mortality differential provides a 'weighting' factor to account for differences between Scotland age-specific mortality and local trends.

Using the national projection mortality rates, the local area mortality differential is calculated against the Scotland rates over the period 2002-13.

The differential is fed into the Main projection.

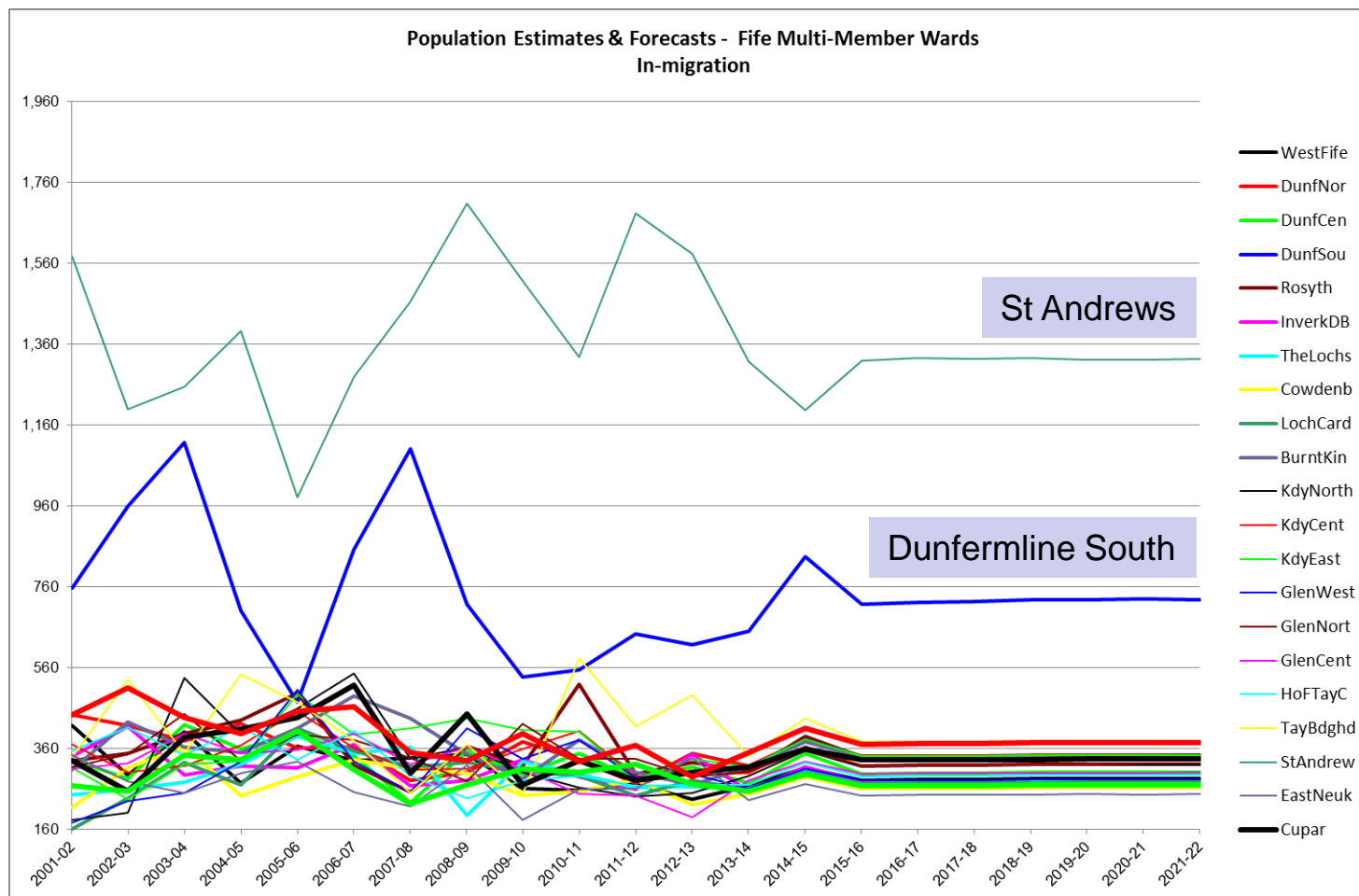
There are variations to the SMR within Fife

Fife Standardised Mortality Ratio 2001-2022



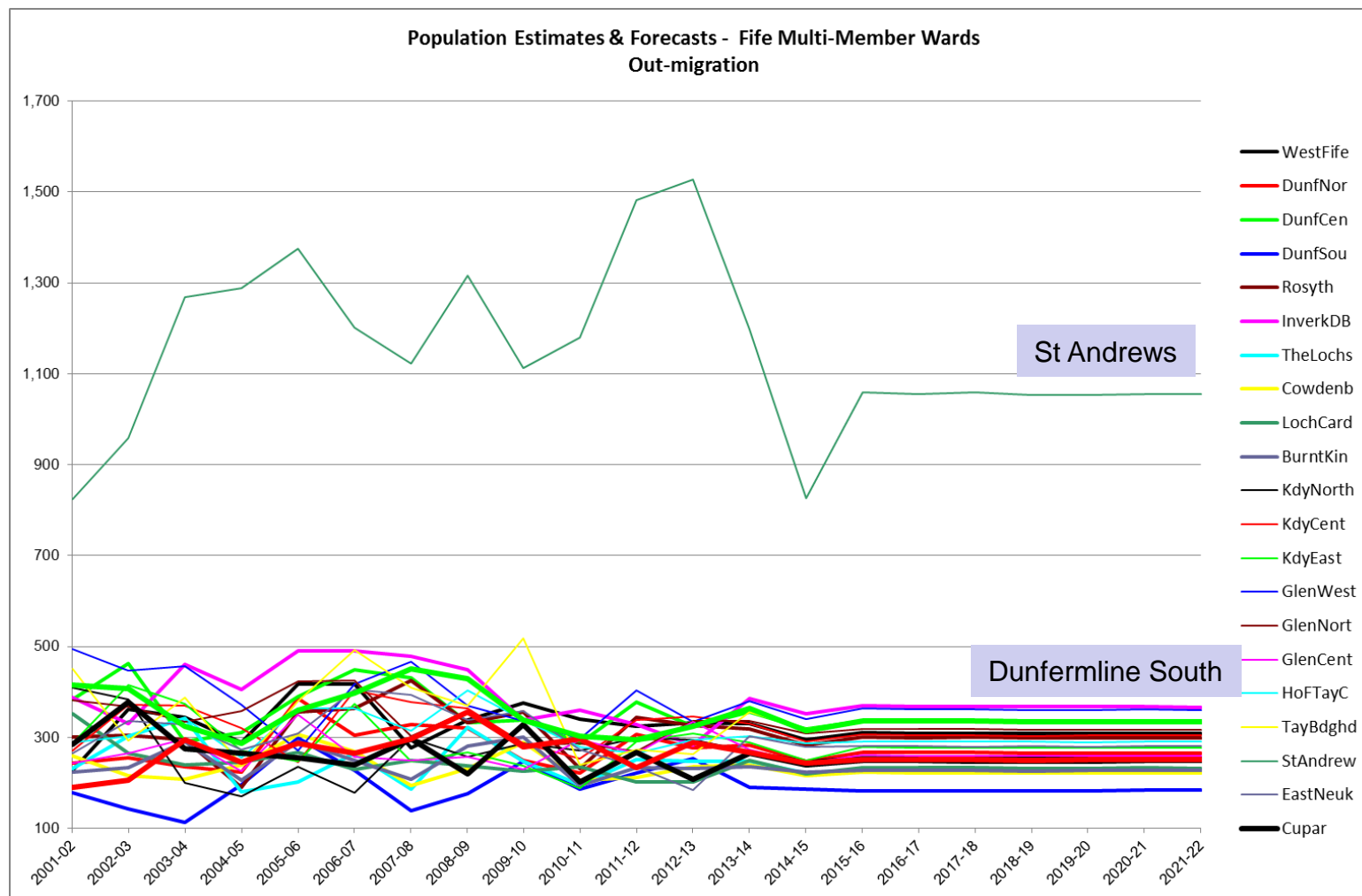
The SMR follows the downward trend for Scotland and picks up differences between local areas

Fife In-Migration 2001-2022



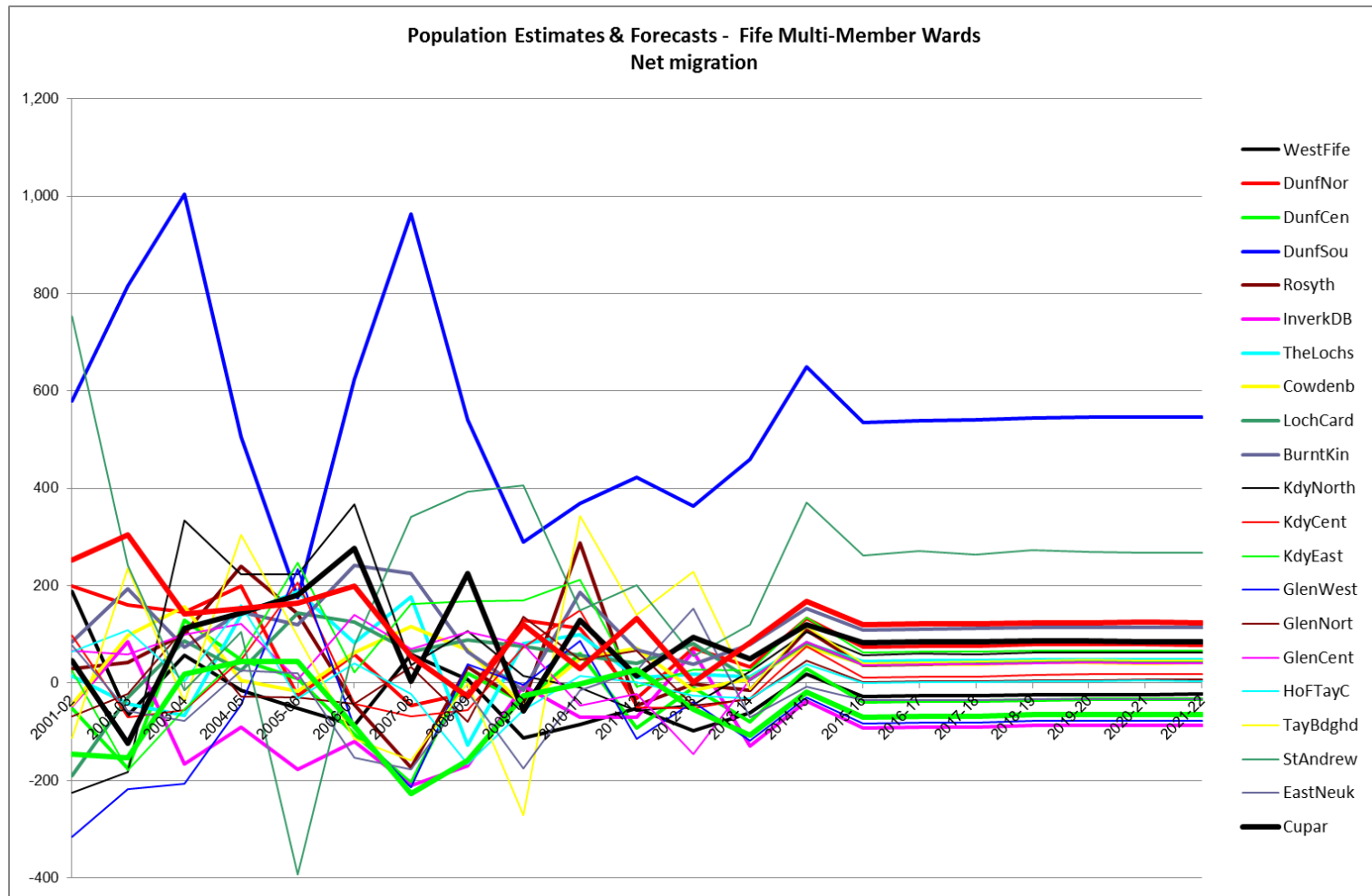
In-migration varies within Fife's areas

Fife Out-Migration 2001-2022



Out-migration is more consistent within Fife's areas than in-migration

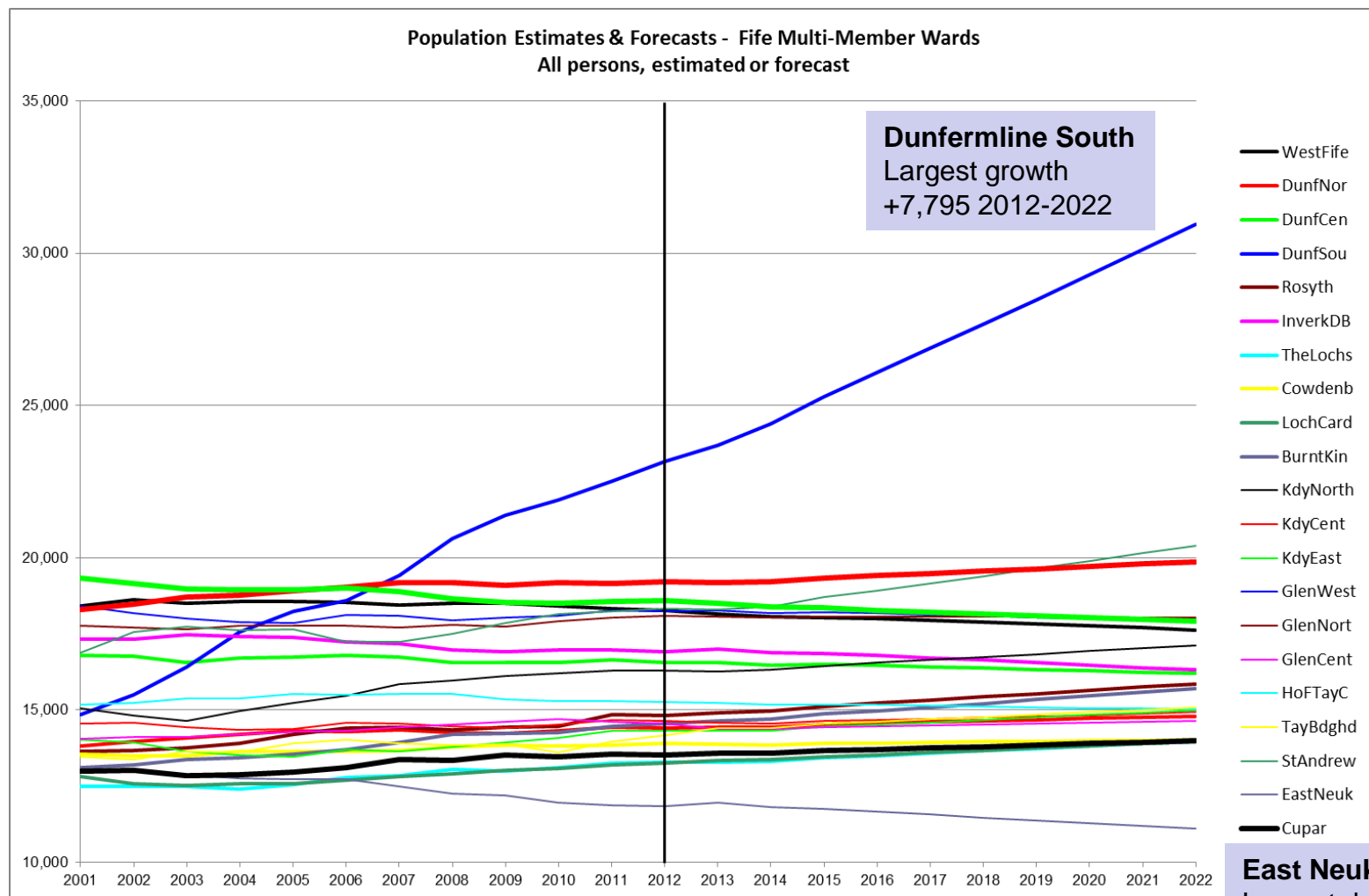
Fife Net Migration 2001-2022



Net migration shows the variations within Fife's areas and their volatility

Results

Draft Fife Population Projection 2012-2022



Assumptions at Scottish level scaled to local area
– captures different characteristics of area

Draft Fife Population Projection Table 2012-2022

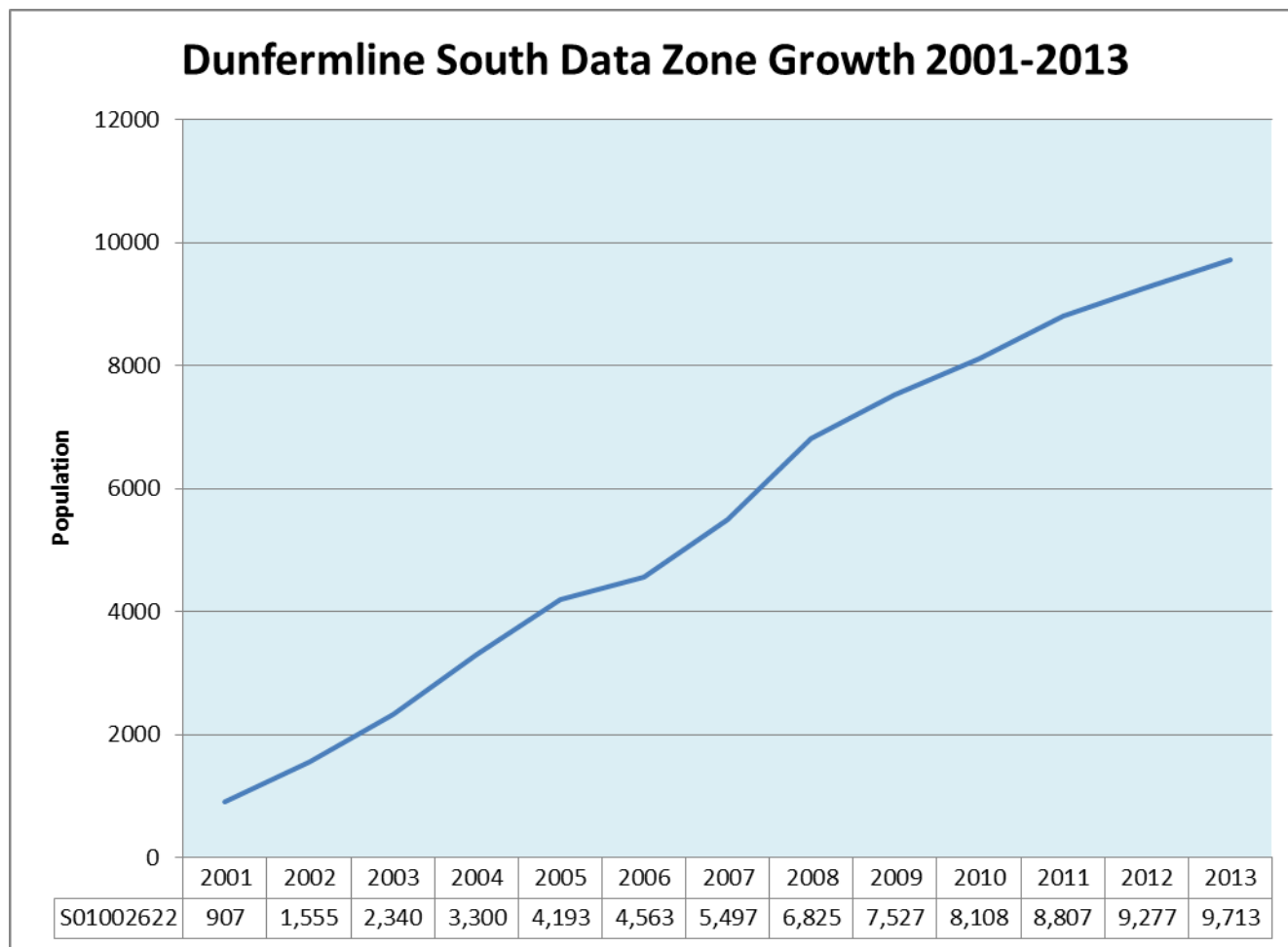
Draft Population Projection for Fife Council Area 2012-2022 All People (2012-based)

Ward	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Difference 2012-2022
Buckhaven, Methil and Wemyss Villages	18,596	18,500	18,379	18,350	18,277	18,209	18,144	18,083	18,024	17,964	17,904	-692
Burntisland, Kinghorn and Western Kirkcaldy	14,567	14,633	14,713	14,868	14,981	15,098	15,216	15,336	15,458	15,578	15,700	1,133
Cowdenbeath	13,903	13,864	13,850	13,900	13,916	13,934	13,952	13,972	13,990	14,007	14,022	119
Cupar	13,525	13,576	13,585	13,663	13,705	13,750	13,796	13,843	13,891	13,939	13,986	461
Dunfermline Central	16,567	16,563	16,480	16,503	16,459	16,417	16,373	16,329	16,286	16,240	16,191	-376
Dunfermline North	14,395	14,446	14,441	14,533	14,569	14,607	14,644	14,685	14,724	14,763	14,800	405
Dunfermline South	23,162	23,703	24,398	25,287	26,072	26,868	27,671	28,485	29,304	30,128	30,957	7,795
East Neuk and Land Ward	11,847	11,947	11,817	11,751	11,657	11,564	11,472	11,381	11,290	11,197	11,104	-743
Glenrothes Central and Thornton	14,567	14,388	14,378	14,445	14,467	14,492	14,518	14,546	14,575	14,604	14,633	66
Glenrothes North, Leslie and Markinch	18,089	18,051	18,024	18,072	18,073	18,074	18,070	18,065	18,055	18,041	18,021	-68
Glenrothes West and Kinglassie	18,229	18,262	18,192	18,207	18,168	18,128	18,088	18,047	18,003	17,955	17,905	-324
Howe of Fife and Tay Coast	15,263	15,220	15,169	15,186	15,162	15,140	15,117	15,094	15,070	15,045	15,018	-245
Inverkeithing and Dalgety Bay	16,921	16,993	16,887	16,869	16,793	16,716	16,638	16,559	16,479	16,396	16,311	-610
Kirkcaldy Central	14,639	14,590	14,565	14,651	14,678	14,711	14,747	14,790	14,834	14,880	14,927	288
Kirkcaldy East	14,320	14,313	14,329	14,458	14,523	14,595	14,671	14,752	14,835	14,920	15,004	684
Kirkcaldy North	16,284	16,259	16,316	16,455	16,548	16,644	16,739	16,837	16,935	17,032	17,127	843
Leven, Kennoway and Largo	19,228	19,195	19,226	19,340	19,410	19,485	19,561	19,640	19,719	19,797	19,875	647
Lochgelly and Cardenden	13,243	13,343	13,369	13,472	13,536	13,602	13,671	13,745	13,818	13,892	13,967	724
Rosyth	14,829	14,913	14,956	15,123	15,223	15,326	15,431	15,539	15,645	15,750	15,853	1,024
St. Andrews	18,337	18,312	18,382	18,707	18,928	19,163	19,397	19,645	19,893	20,144	20,401	2,064
Tay Bridgehead	14,170	14,406	14,418	14,559	14,627	14,699	14,772	14,848	14,924	14,998	15,071	901
The Lochs	13,280	13,291	13,328	13,435	13,507	13,584	13,661	13,741	13,821	13,900	13,979	699
West Fife and Coastal Villages	18,259	18,142	18,056	18,047	17,991	17,936	17,880	17,822	17,761	17,696	17,628	-631
Fife	366,220	366,910	367,260	369,879	371,272	372,742	374,227	375,782	377,333	378,867	380,385	14,165

Source: NRS 2015 using POPGROUP v4

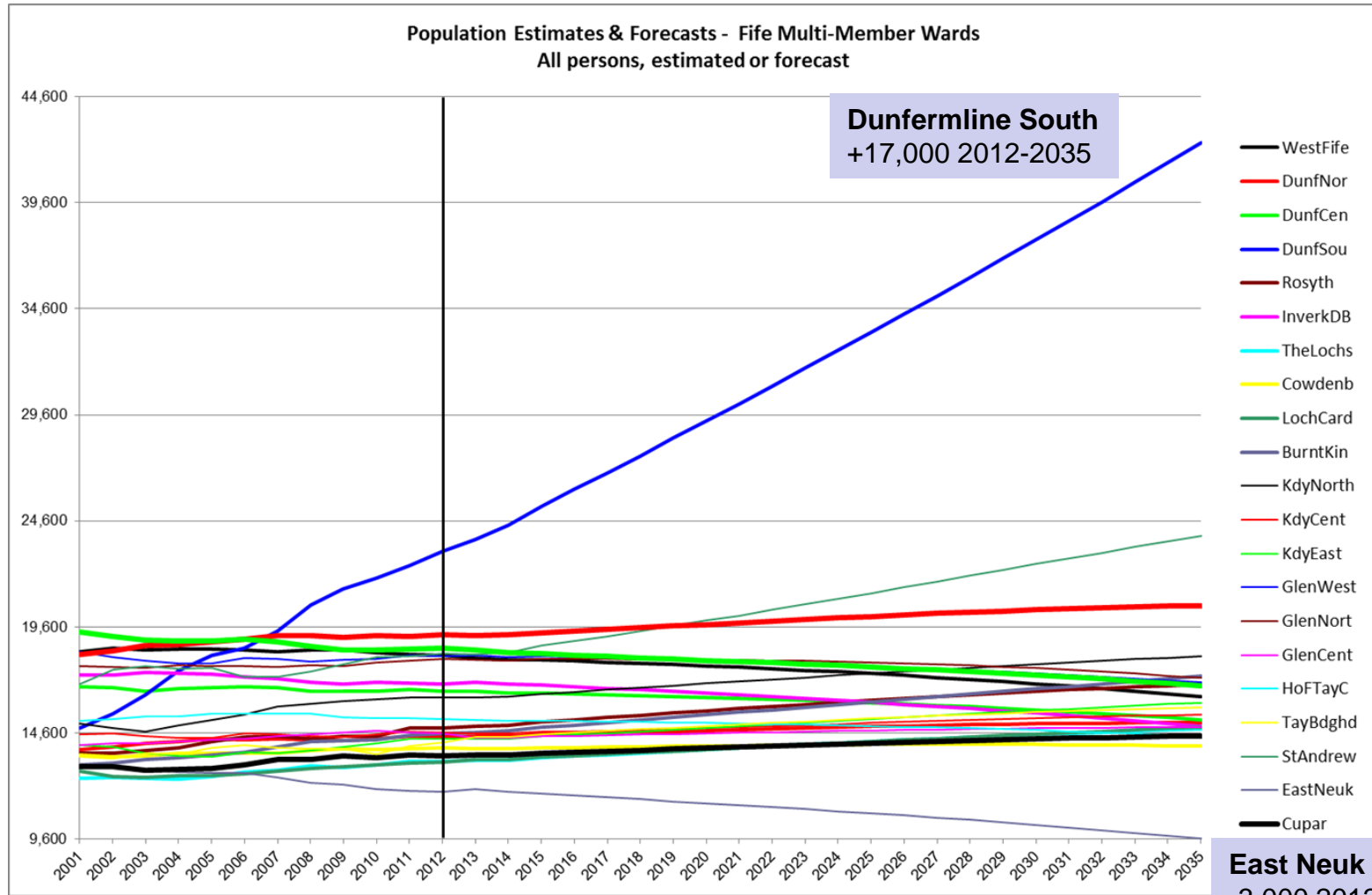
Projections fairly stable for many areas with greatest variation in Burntisland, Rosyth (MOD Caledonia), St Andrews (University) and Tay Bridgehead (RAF Leuchars)

Past Trend Based Projection



Growth in one data zone 2001-2013 shows why continued growth projected

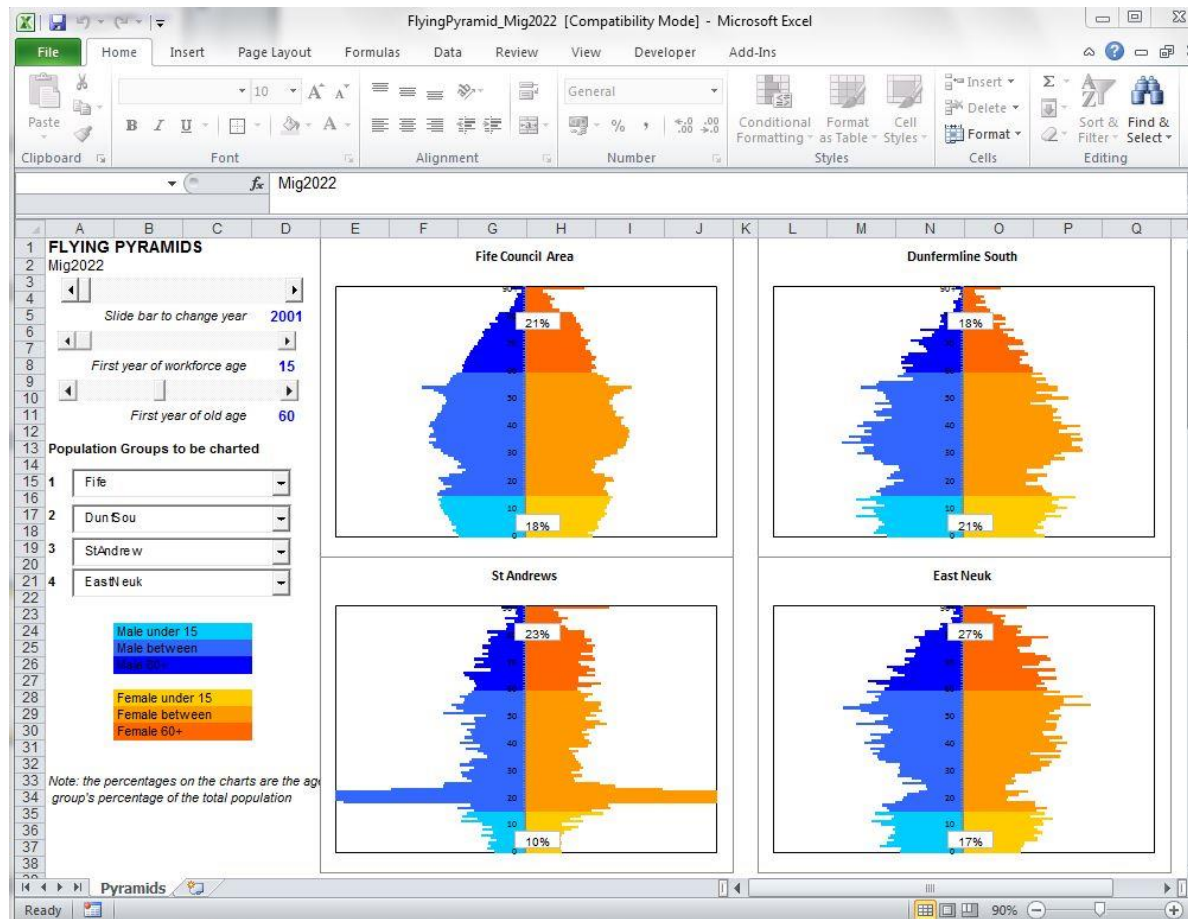
Population Projection Fife 2012-2035



Variation in Sub Areas

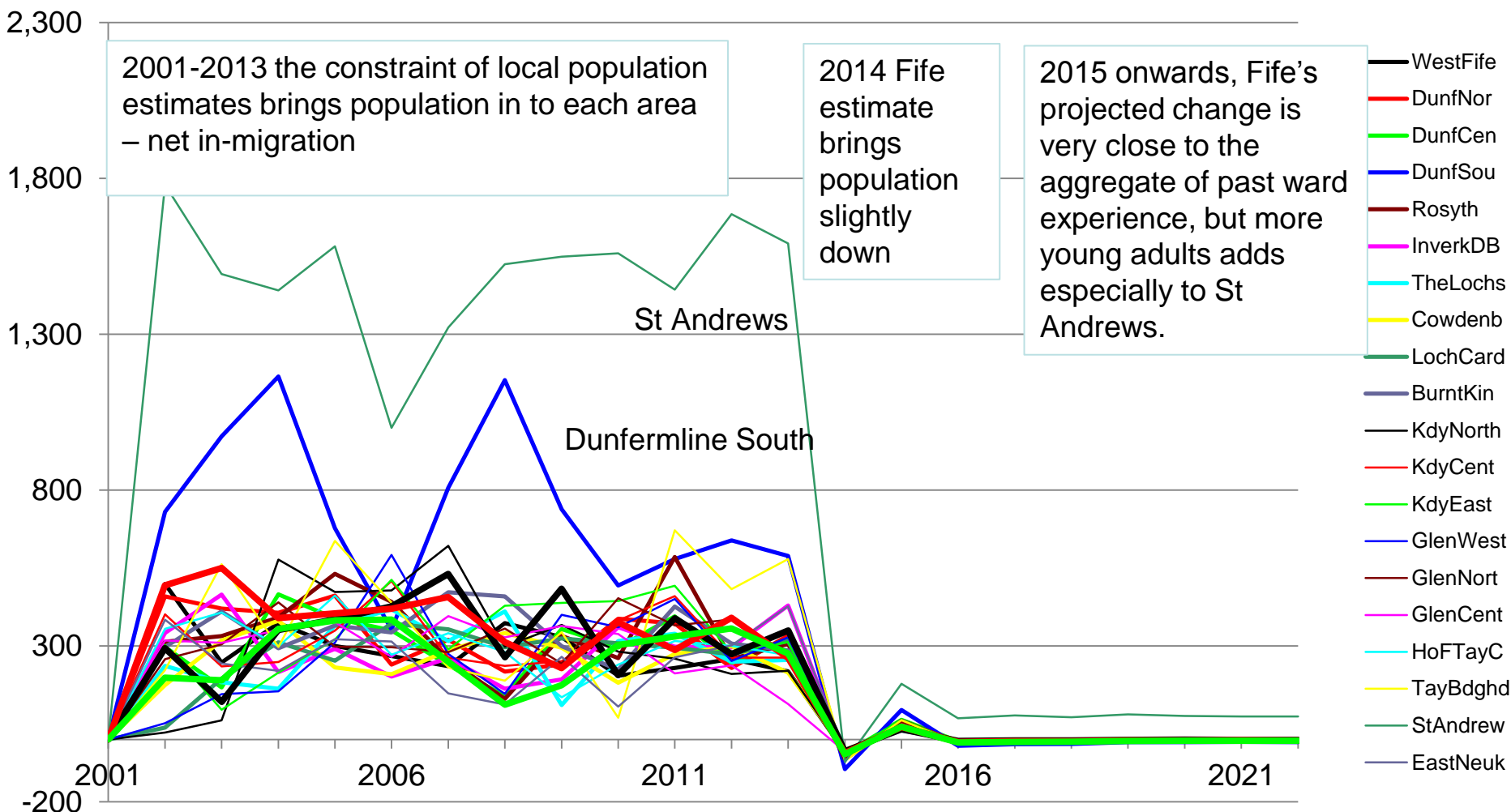
There is variation in the demographic structure of Fife's sub-areas shown in POPGROUP using Flying pyramids

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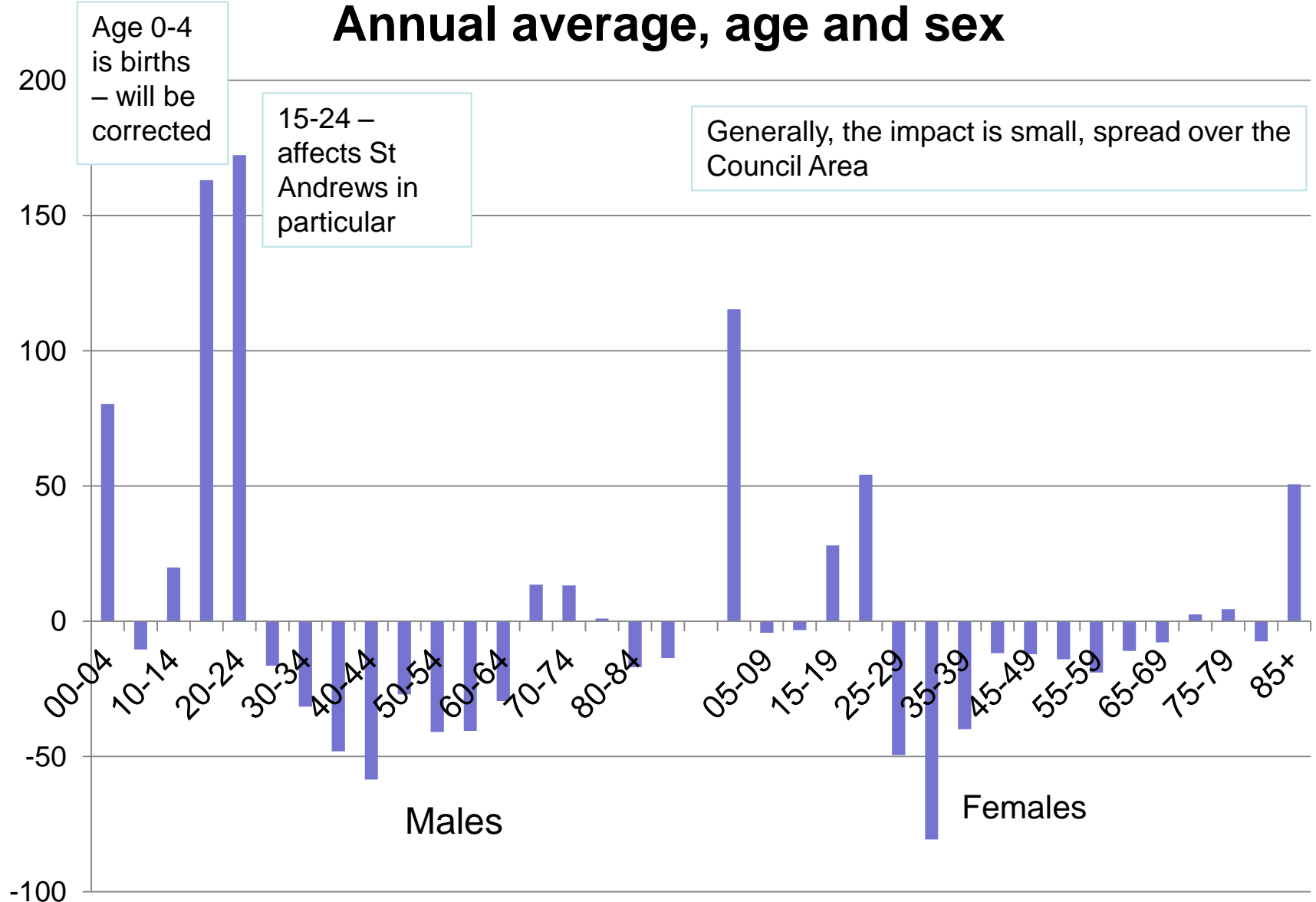
Population Estimates & Forecasts - Fife Multi-Member Wards

Impact of constraint – total population



Impact of constraining to the Fife projection 2015-2022

Annual average, age and sex



Next Steps

Household Projections

- The next stage is to produce household projections
- NRS have their own household projection system in SAS
- This takes the population projections from POPGROUP and using
 - headship rates from the Census and
 - communal establishments
 - produces household projections by area

Next Steps

- Finalise methodology for population projections
- Run final population projections for Fife
- Finalise sub-council area geographies
- Set processing order for projections
- Undertake household projections for Fife
- Produce projections for remaining council areas
- Complete project by end March 2016
- Publish projections

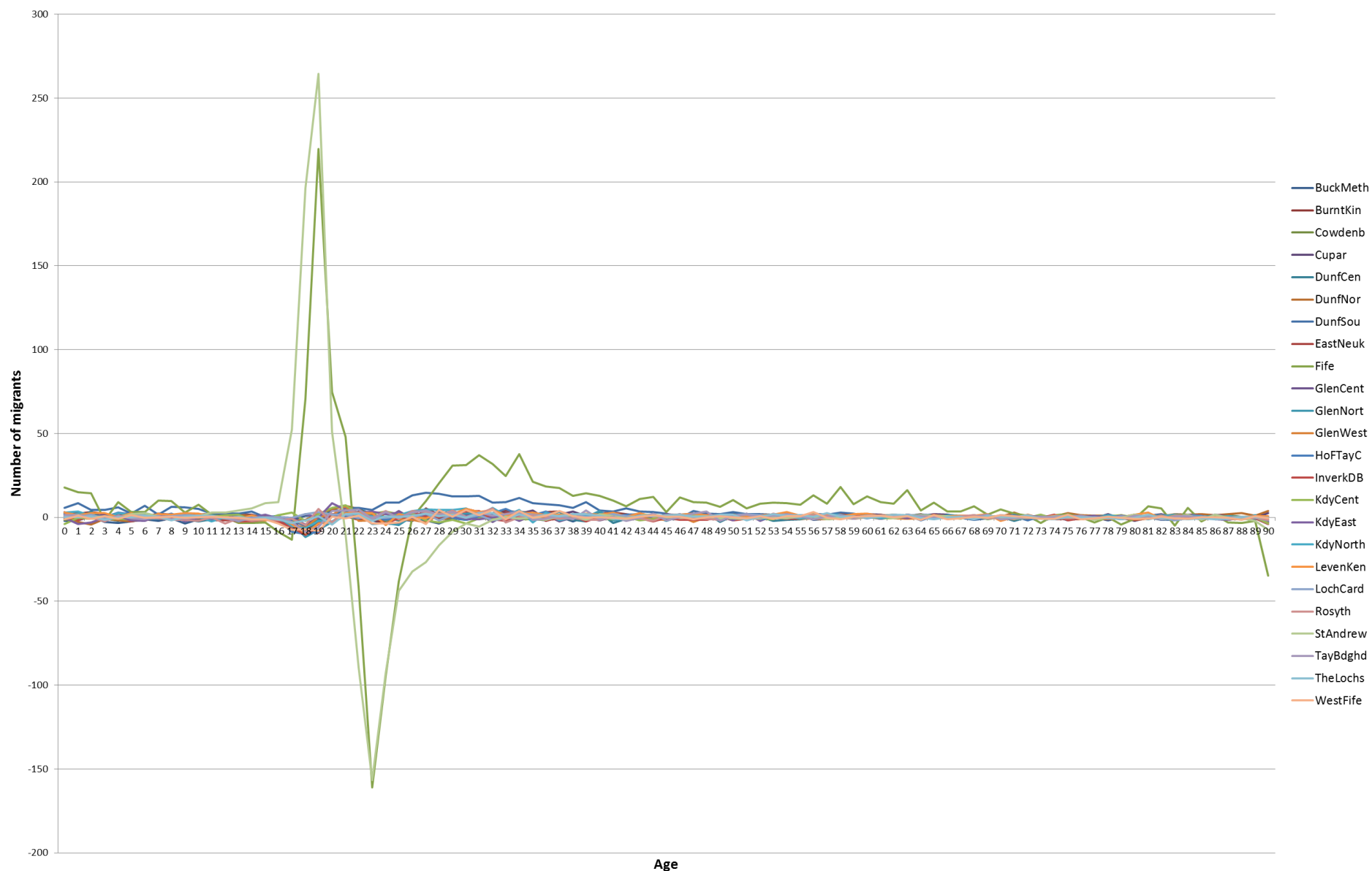
Background tables

Population Estimates for Fife Council Area 2001-2012 All People

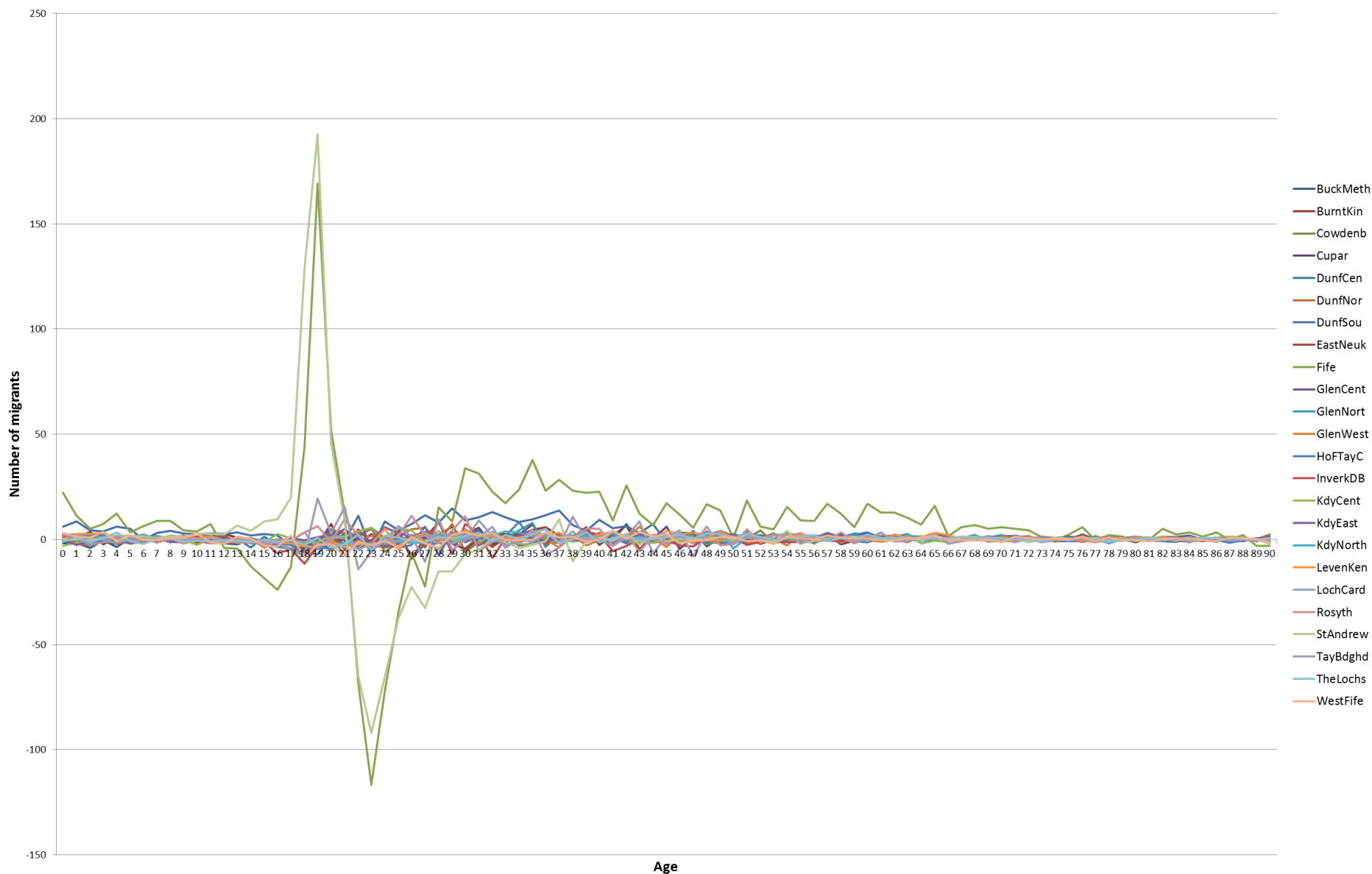
Ward	2,001	2,002	2,003	2,004	2,005	2,006	2,007	2,008	2,009	2,010	2,011	2,012	Difference 2012-2022
Buckhaven, Methil and Wemyss Villages	19,342	19,154	18,967	18,941	18,951	19,006	18,898	18,665	18,535	18,510	18,555	18,596	-746
Burntisland, Kinghorn and Western Kirkcaldy	13,102	13,186	13,373	13,427	13,563	13,693	13,933	14,188	14,240	14,268	14,480	14,567	1,465
Cowdenbeath	13,556	13,487	13,506	13,649	13,652	13,637	13,663	13,788	13,850	13,818	13,848	13,903	347
Cupar	12,994	13,008	12,844	12,887	12,948	13,115	13,364	13,339	13,516	13,450	13,551	13,525	531
Dunfermline Central	16,797	16,759	16,559	16,695	16,741	16,787	16,741	16,552	16,559	16,549	16,648	16,567	-230
Dunfermline North	13,811	13,954	14,097	14,206	14,331	14,301	14,346	14,271	14,234	14,327	14,439	14,395	584
Dunfermline South	14,839	15,499	16,421	17,563	18,249	18,592	19,417	20,640	21,399	21,905	22,508	23,162	8,323
East Neuk and Land Ward	12,991	13,023	12,887	12,759	12,726	12,712	12,494	12,259	12,188	11,948	11,884	11,847	-1,144
Glenrothes Central and Thornton	14,045	14,098	14,121	14,198	14,303	14,328	14,451	14,532	14,626	14,696	14,609	14,567	522
Glenrothes North, Leslie and Markinch	17,767	17,696	17,650	17,778	17,770	17,766	17,720	17,799	17,749	17,916	18,022	18,089	322
Glenrothes West and Kinglassie	18,432	18,189	18,018	17,880	17,867	18,132	18,108	17,948	18,038	18,104	18,263	18,229	-203
Howe of Fife and Tay Coast	15,161	15,238	15,366	15,377	15,521	15,494	15,515	15,517	15,337	15,292	15,295	15,263	102
Inverkeithing and Dalgety Bay	17,313	17,338	17,469	17,411	17,389	17,230	17,168	16,986	16,904	16,973	16,959	16,921	-392
Kirkcaldy Central	14,541	14,583	14,436	14,357	14,381	14,582	14,547	14,459	14,419	14,533	14,681	14,639	98
Kirkcaldy East	14,014	13,943	13,649	13,518	13,476	13,702	13,642	13,784	13,929	14,095	14,322	14,320	306
Kirkcaldy North	15,048	14,814	14,653	14,975	15,227	15,462	15,855	15,978	16,116	16,203	16,282	16,284	1,236
Leven, Kennoway and Largo	18,309	18,486	18,712	18,776	18,905	19,044	19,191	19,185	19,109	19,187	19,150	19,228	919
Lochgelly and Cardenden	12,806	12,566	12,521	12,575	12,570	12,694	12,813	12,909	13,023	13,089	13,188	13,243	437
Rosyth	13,637	13,666	13,755	13,897	14,196	14,409	14,446	14,343	14,433	14,464	14,838	14,829	1,192
St. Andrews	16,893	17,569	17,735	17,618	17,664	17,232	17,228	17,508	17,843	18,162	18,228	18,337	1,444
Tay Bridgehead	13,470	13,379	13,629	13,597	13,920	14,034	13,920	13,842	13,864	13,616	13,978	14,170	700
The Lochs	12,485	12,491	12,477	12,413	12,545	12,776	12,847	13,050	12,987	13,102	13,255	13,280	795
West Fife and Coastal Villages	18,417	18,614	18,505	18,553	18,555	18,532	18,443	18,508	18,512	18,403	18,317	18,259	-158
Fife	351,771	352,742	353,353	355,054	357,455	359,266	360,757	362,058	363,419	364,620	367,311	368,232	16,450

Source: NRS 2015 using POPGROUP v4

Female net migrants annual average 2001-2013



Male net migrants annual average 2001-2013



Special populations

Armed Forces

Armed Forces Bases		
Council area	Ward	Armed Force Base
Angus	Arbroath West and Letham	RM Condor
Argyll & Bute	Lomond North	HMS Neptune Faslane
Edinburgh	Almond	Craigiehall Barracks
Edinburgh	Colinton / Fairmilehead	Dreghorn Barracks
Edinburgh	Colinton / Fairmilehead	Redford Cavalry Barracks
Edinburgh	City Centre	Edinburgh Castle
Fife	Rosyth	MOD Caledonia
Fife	Tay Bridgehead	RAF Leuchars
Highland	Culloden and Ardersier	Fort George
Midlothian	Midlothian West	Glencorse Barracks
Moray	Heldon and Laich	RAF Lossiemouth
Moray	Forres	RAF Kinloss

Prisoners

Prisons		
Council area	Ward	Prison
Aberdeen City	Torry / Ferryhill	Aberdeen
Aberdeenshire	Peterhead South and Cruden	Peterhead
Angus	Brechin and Edzell	Noranside
Clackmannanshire	Clackmannanshire West	Glenochil Prison
Dumfries & Galloway	North West Dumfries	Dumfries
East Ayrshire	Irvine Valley	Kilmarnock
East Dunbartonshire	Lenzie and Kirkintilloch South	Low Moss
Edinburgh	Sighthill / Gorgie	Edinburgh
Falkirk	Lower Braes	Polmont
Glasgow City	East Centre	Barlinnie
Highland	Inverness Central	Inverness
Inverclyde	Inverclyde South	Greenock
North Lanarkshire	Fortissat	Shotts
Perth & Kinross	Carse of Gowrie	Castle Huntly
Perth & Kinross	Perth City Centre	Perth
Stirling	Castle	Corton Vale
West Lothian	Fauldhouse and the Breich Valley	Addiewell

Students